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FOREST INSECT SURVEYS

MOUNT HOOD NATIONAL FOREST AND ADJACENT TIMBERLANDS

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PORTLAND OREGON AUGUST 1956

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Field and Office Work on Mt. Hood National Forest Surveys

By

Numerous field assistants of the former Bureau of Entomology and Plant Quarantine. Acknowledgment is made to personnel of the regional office, National Forest Administration, Region 6, and the forest Supervisor and his staff and the Oregon State Board of Forestry for assistance in conducting these surveys.

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By

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SUMMARY

Pine beetle check plot data for the period 1946 to 1954 and the major forest insect conditions on the Mount Hood National Forest from 1951 to 1955 are summarized in this report. Other tree mortality caused by bears and an unknown pathogen of western hemlock are discussed.

From 1946 to 1954, pine losses on the check plots averaged 50 board feet per acre with a range from 23 board feet to 117 board feet per acre. Since 1946, the losses have been endemic and the overall trend has been downward. Sanitation-salvage logging and prompt salvage of infested trees have accounted for part of this reduction in mortality.

Outbreaks of other bark beetles fluctuated widely from 1951 to 1955. The peak of these epidemics was reached in 1953 and has been followed by a subsequent recession on most areas.

Epidemic infestations of the spruce budworm have not been detected since the 39,795 acre control project of 1952.

An aggressive epidemic outbreak of the balsam woolly aphid, seriously threatening mature stands of Pacific silver fir, was detected in 1955. Detailed study of the insect is necessary before control measures can be developed.

FOREST INSECT SURVEYS

MOUNT HOOD NATIONAL FOREST AND ADJACENT TIMBERLANDS

1946 - 1955

INTRODUCTION

The western pine beetle, Dendroctonus brevicomis Lec. and adverse climatic and physiological factors over a prolonged period, have seriously depleted the mature ponderosa pine stands on the Mount Hood National Forest and adjacent timberlands. Intensive check plot cruises since 1937 have been the basis for recording the timber drain caused by this insect. The primary objectives of these surveys are: (1) To follow the trend of insect-caused losses, (2) to determine units needing direct control work, (3) to determine the type of trees most susceptible to insect attack, and (4) to locate units of high hazard warranting primary consideration in management planning.

Damage caused by other bark beetles and defoliators has been recorded by annual cooperative aerial and ground surveys. These aerial surveys are an economical and accurate method of detecting and evaluating new insect outbreaks on the forest.

SURVEY METHODS

Pine Beetle Check Plots

Annual losses on the check plots were determined by 100 percent cruises of representative half-section plots by a three-man party consisting of a compassman and two spotters. Four lines, 10 chains wide and one mile long were run through the long axis of each plot. Data recorded for each insect-killed tree consisted of: (1) Keen's tree class, (2) year of kill, (3) diameter, and (4) insect responsible. Windthrown trees were recorded by diameter class and year of fall. The volume of both insect-killed and windthrown trees was computed from local volume tables.

Insect-killed trees were recognized by their faded green or sorrel color, boring dust in bark crevices, or the presence of pitch tubes on the bark. At the time of the cruise only a portion of the current year's kill had faded and is recorded. The remainder of the current season's loss is picked up during the next cruise.

Happy Ridge plot is the only remaining virgin plot of the three established in 1937. Burnt Mill and Eightmile Creek plots were cutover and have been abandoned.

Aerial and Ground Surveys

The appraisal of the forest insect situation prior to 1947 was made by ground surveys and observations from lookout stations and other points of vantage within the forest. Since then, extensive ground surveys have been used to supplement aerial survey findings, and for special purposes. The recent spruce budworm ground survey is an example of the latter type. The surveys have been a cooperative undertaking between the Oregon State Board of Forestry, U. S. Forest Service, the Experiment Station, and private industry.

Aerial insect surveys were begun on the forest in 1947 on a limited basis by the former Bureau of Entomology and Plant Quarantine. In 1948, cooperative aerial surveys on a wide scale were made by the Oregon State Board of Forestry and the former Bureau of Entomology and have been continued annually.

This forest, on the aerial survey flight lines are flown in a north-south direction approximately 4 to 6 miles apart over the rolling country on the eastside and on the contour up and down drainages over the more rugged westside terrain. The aerial survey team consists of a pilot and two observers who sketch-map all insect damage in place with regard to the severity of damage, area affected, insect species responsible, and tree species involved. Results of these surveys are verified by careful ground examination of infestations, especially those about which there was some doubt at the time of mapping.

Personnel

Pine beetle check plot survey crews have been composed of men from the U. S. Forest Service and the former Bureau of Entomology and Plant Quarantine. The spruce budworm plots were established and sampled by personnel of the Oregon State Board of Forestry, U. S. Forest Service, and the Experiment Station.

Cooperative aerial surveys have been made by personnel of the Oregon State Board of Forestry and the Experiment Station. Aerial survey pilots were provided by the Oregon State Board of Forestry, the Experiment Station, and the Agricultural Research Service.

RESULTS OF THE PINE BEETLE CHECK PLOT SURVEYS

Primary Insects

The western pine beetle caused most of the pine mortality recorded on the plots. The mountain pine beetle, Dendroctonus monticolae Hopk., the California melanophila, Melanophila californica VD., the Oregon pine engraver, Ips oregoni Eichh., and the emarginate ips, Ips emarginatus Lec., separately or in combination with the western pine beetle accounted for the remainder of the losses on the plots.

Pine Beetle Check Plot Losses

Table 1 summarizes western pine beetle losses on the check plots from 1946 to 1954 inclusive. The trend in beetle-caused mortality since the plots were established is shown in Figure 1.

During the 9-year period losses on the Happy Ridge plot totalled 143,300 board feet, or 4.17 percent of the stand volume. Losses decreased from 117 board feet per acre in 1946 to a record low of 23 board feet per acre in 1950. A slight increase occurred in 1951 following the widespread blowdown in the winter of 1950-1951. Since 1953, a downward trend has been evident. Partial plot records and general field observations in 1955 indicate that this trend will continue.

Current beetle-caused losses on the forest are among the lowest on record. As the forest is converted to a managed stand, future pine losses should be even lower as a result of the removal of high risk trees from the stand.

Windfall

From 1946 to 1954, inclusive, a total of 9,430 board feet of windfall was recorded on Happy Ridge plot. This occurred in 1946, 1950, 1953, and 1954 with losses amounting to 11, 3, 10, and 4 board feet per acre respectively. Windthrown trees are frequently overlooked by the cruisers and are quite difficult to date accurately. For this reason, it is felt that these figures are conservative.

GENERAL FOREST INSECT CONDITIONS 1951 - 1955

A summary of bark beetle infestations detected by the aerial surveys from 1951 to 1955 is given in Table 2. Copies of quarter-inch maps showing centers of infestation on this forest have been furnished to the Supervisor. A brief discussion of the major insect infestations follows:

1. Western Pine Beetle - On the forest as a whole, only 3 centers of light western pine beetle damage were detected in 1955. These occupied a total of 2,720 acres in Eightmile Creek, South Fork Fivemile Creek, and Cedar Swamp Creek drainages. They show a slight increase over the two centers on 1,920 acres recorded in 1954. Infestations of the last two years are a marked reduction over 46,000 acres in 1952 and 36,000 acres in 1953. With the reduction both in size and intensity of the damage, no direct control is required; however, continued sanitation-salvage cutting in high risk areas is desirable.

2. Mountain Pine Beetle - Epidemic infestations in high altitude lodgepole and white pine stands declined from 10,880 acres in 1954 to 6,720 acres in 1955 but increased in number from 19 to 39. In general no attempt has been made to control the infestations due to the low timber values involved.

3. Douglas-fir Beetle - Following severe windthrow in the winter of 1950-1951, a severe Douglas-fir beetle epidemic developed and reached a peak in 1953 when 191,050 acres were infested. The infestation declined since then to 21,600 acres of light and moderate infestations in 1955. Main epidemic centers were located in the high-value Douglas-fir stands of the Clackamas River drainage. It is encouraging to note that the prompt access road and salvage programs have aided this decline in beetle damage.

4. Pine Engraver Beetles - These beetles attack and kill young ponderosa pine stands and the tops of decadent or injured, mature trees. Logging slash, damage to advanced reproduction, and fire injuries often create ideal conditions for aggressive buildups particularly in young stands. In 1955, epidemic infestations occurred on 1,120 acres at Happy Ridge, Sunflower Flat, and McCubbin Gulch. These epidemics are the first on record since 1952. The outbreak is well below the normal loss expected on forests in this region, and no control is recommended.

5. Silver Fir Beetle - One 640-acre infestation was recorded on Bald Mountain in 1953. The following season, 3 centers of infestation developed on 3,680 acres in the Bull Run drainage. No epidemic outbreaks have been detected in the last two years although individual tree-killing is evident in most silver fir stands. This beetle frequently kills silver fir weakened by the balsam wooly aphid.

6. Fir Engraver Beetle - The peak in the present epidemic was reached in 1953 when 14 widely separated centers of infestation in true fir stands were recorded on 11,040 acres. In 1954, four centers of epidemic infestation occurred on 960 acres in Newton Creek, Sand Canyon, Echo Point, and Yokum Ridge. An outbreak on 640 acres east of Flag Point was the only damage caused by this insect in 1955. The continuing downward trend of damage in high altitude true fir stands is encouraging. No direct control against this beetle has been attempted.

7. Spruce Budworm - The budworm epidemic in true fir and Douglas-fir stands developed in 1948. Intensive aerial and ground surveys that year recorded 102,700 acres of infestation. Together with a buffer zone, an area of 106,000 acres was sprayed in 1949. Two centers of epidemic infestation totalling 32,900 acres and adjacent to the 1949 treated area were sprayed in 1950. In 1951, some 18,485 acres of infestation adjoined and partially overlapped the 1949 and 1950 control units. The continued development of this epidemic was due to delayed spray application in 1949 caused by late appropriation of federal funds and a rapid increase of budworm population in stands surrounding the control units. Some reinvasion of the sprayed areas occurred. In 1952, two centers totalling 22,560 acres were successfully sprayed. The northern center, in the Hood River drainage, joined stands treated in 1951 while the southern center extended onto the Warm Springs Reservation from an area sprayed in 1949. Since 1952, no epidemic infestations of the budworm have been recorded although light numbers of larvae, undetectable from the air, have been recorded by the annual ground survey.

A summary of the spruce budworm situation on the forest from 1948 to 1952 is as follows:

Year of Survey	Damage Intensity				Year of Spray	Acreage Sprayed
	Light (Acres)	Moderate (Acres)	Heavy (Acres)	Total (Acres)		
1948	68,960	28,160	5,650	102,790		
1949	7,470			7,470	1949	106,000
1950	2,200	15,725	560	18,485	1950	35,455
1951	12,000	8,960	1,600	22,560	1951	47,260
					1952	39,795

8. Balsam Woolly Aphid - This aphid has been known to attack true firs in the vicinity of Mount Hood for some time. In 1955, serious damage to Pacific silver fir was detected on 21,600 acres and ranged in intensity from light to heavy. The infestations were located at 18 centers on the Bull Run and the Middle and East Forks of Hood River and Salmon River. Two types of attack occur in this area: (1) Twig and branch gouting, caused by the feeding punctures on the twigs and smaller branches, and (2) bole infestations, covered by the characteristic white, waxy "wool" exuded by the adult female. The former type of damage is most common on the westside fir. Bole infestations are more aggressive, girdling large sections of the trunk which often causes the death of the tree in one year. Branch infestations cause defoliation and generally take longer to kill the tree. No control is known at present. Where the dead timber is merchantable, salvage logging is warranted on a priority basis.

9. Bear Damage - In 1954, bears caused considerable mortality in immature trees on 6,560 acres. By 1955, the damage was recorded on 7,520 acres in the Sandy River, Larch Mountain, and Bull Run areas. The damage occurs in the early spring when the animals evidently seek to augment a deficient diet by feeding on the succulent cambial tissues of the young, vigorous trees. The damage is largely confined to Douglas-fir but has occasionally been noted on western hemlock, western white pine, and western redcedar.

10. Dying Hemlock - In 1955, dying western hemlock was detected on 10,080 acres on the Bull Run and Sandy River drainages. The cause of this mortality is not definitely known but may be due to a complex of factors such as site disturbance, soil conditions, fungi, and insects. More detailed study of this problem is necessary. Prompt salvage of the dead timber, when accessible, appears to be the only solution to the problem at present.

TABLE 1. PONDEROSA PINE VIRGIN CHECK PLOT LOSSES
MOUNT HOOD NATIONAL FOREST
Seasons 1946 - 1954

Area, Plot, and Location	Ponderosa Pine		Year	No. of Trees	Volume Loss		Percent of Stand	Ratio to Previous Year's Loss
	Area (Acres)	Volume (Mbm)			Total (fbm)	Per Acre (fbm)		
EASTSIDE AREA								
Happy Ridge Plot	320	3,450	1946	50	37,310	117	1.08	.99
T3S,R11E,26 s/2			1947	27	21,920	68	.64	.56
			1948	18	11,340	35	.33	.51
			1949	12	11,980	37	.35	1.06
			1950	8	7,290	23	.21	.61
			1951	11	9,870	31	.29	1.35
			1952	16	16,520	52	.48	1.67
			1953	13	15,410	48	.45	.93
			1954	10	11,660	36	.34	.76
TOTAL			9	165	143,300	447	4.17	8.44
AVERAGE				18.3	15,922	50	.46	.94

TABLE 2 - GENERAL FOREST INSECT CONDITIONS ON THE
MOUNT HOOD NATIONAL FOREST
Seasons of 1951-1955

CAUSE OF MORTALITY	1951		1952		1953		1954		1955	
	No. of Centers	Acres	No. of Centers	Acres	No. of Centers	Acres	No. of Centers	Acres	No. of Centers	Acres
1. WESTERN PINE BEETLE *Dendroctonus brevicomis*			7	46,130	8	36,640	2	1,920	3	2,720
2. MOUNTAIN PINE BEETLE *Dendroctonus monticolae*	2	800	5	6,880	4	4,480	19	10,800	39	6,720
3. DOUGLAS-FIR BEETLE *Dendroctonus pseudotsugae*	2	500	20	6,100	49	191,050	49	181,470	32	21,600
4. PINE ENGRAVER BEETLES *Ips* spp.			2	420					4	1,120
5. SILVER FIR BEETLES *Pseudohylesinus* spp.					1	640	3	3,680		
6. FIR ENGRAVER BEETLES *Scolytus* spp.					14	11,040	4	960	1	640
7. BALSAM WOOLLY APHID *Chermes piceae*									18	21,600
8. BEAR DAMAGE									12	7,520
9. DYING HEMLOCK Cause Unknown									4	10,080

TABLE 3 - REPORTS ON FOREST INSECT CONDITIONS ON THE MOUNT HOOD NATIONAL FOREST AND ADJACENT LANDS

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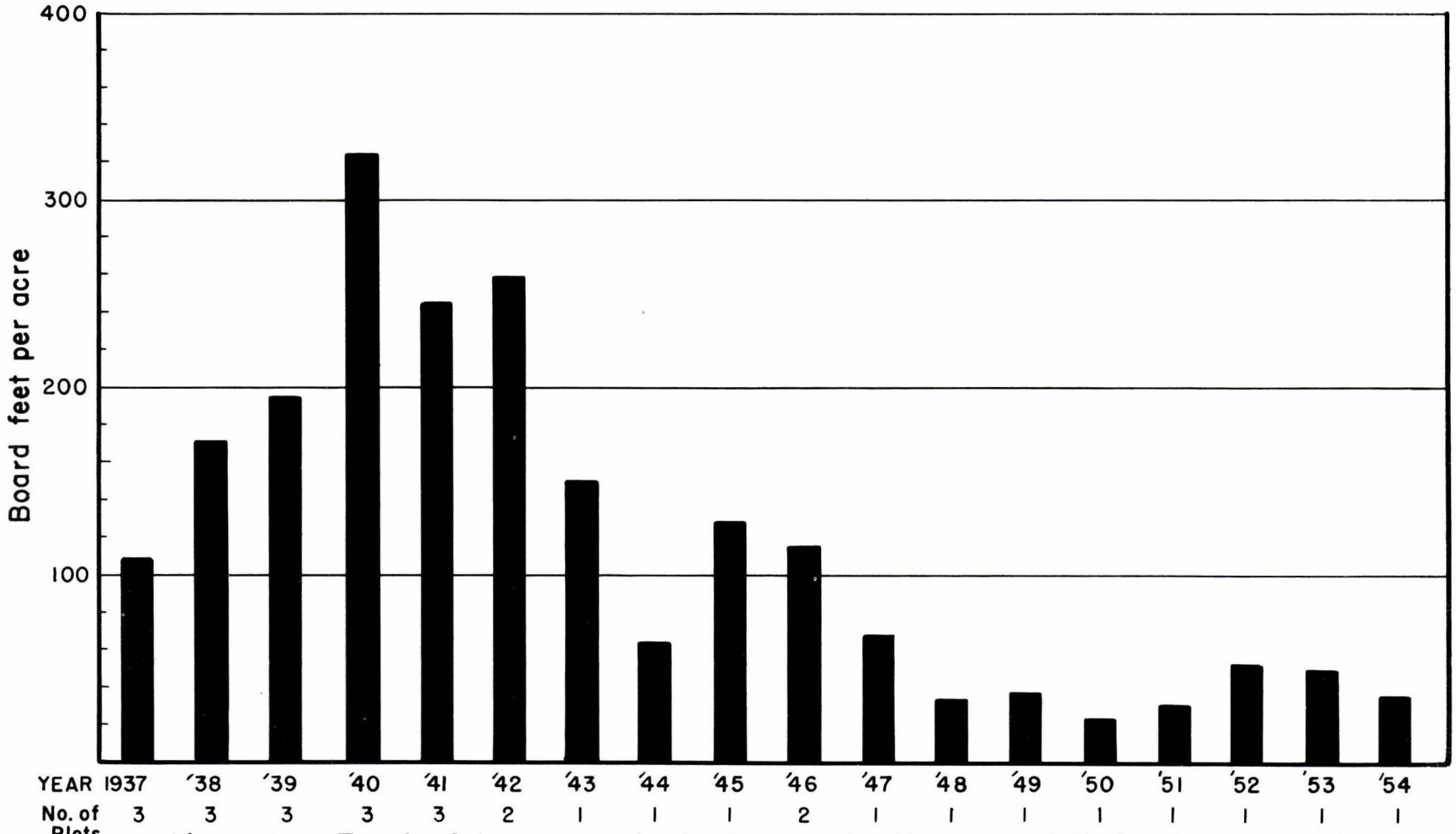

Figure 1-- Trend of losses on check plots on the Mount Hood National Forest and adjacent timberlands